

Meteorological stations thus far have been established at Baba, Barraganetal, Chobo, Rocafuerte, and Tonguel, to which 45 others are being selected.

### IS VENUS CLOUD COVERED?

Mr. Evershed has taken many photographs of the spectrum of Venus in recent years for the purpose (inter alia) of endeavoring to detect the Einstein shift and of testing his own hypothesis that the earth has an effect on the atmospheric circulation of the sun. In the course of this work he found, to his surprise, that a much longer exposure time was needed than was the case in photographing the spectrum of a cumulus cloud on which the sun was shining (Monthly Notices R. A. S., November). Mr. Evershed expected the time to be shorter, for the intensity of sunlight on Venus is 1.92 times as great as on the earth. Allowing for the absorption of Venus's atmosphere, he concludes that if Venus were covered with clouds similar to our cumulus clouds the exposed time would be less on the former than on the latter in the ratio of 1 to 1.3, whereas the contrary is the case. He concludes that the atmosphere of Venus is not cloud laden, but that its lower strata contain much dust in suspension, veiling the surface features. This conclusion is similar to that reached by Prof. Lowell from his observations at Flagstaff.

Mr. Evershed thinks that the values of the color indices assigned by Prof. N. H. Russell to the sun and Venus (+0.79 m. and +0.78 m.) are mutually inconsistent, since they imply that no selective absorption takes place in Venus's atmosphere. Mr. Evershed finds evidence of decided selective absorption in the violet, as compared with his cloud spectra.—*Nature* (London), Feb. 19, 1920, p. 675.

### REFERENCES TO LITERATURE ON ICE CAVES.

The explanation of the phenomena 'observed' in the ice cave at Coudersport, Pa. (*Scientific American*, May 6, 1919, pp. 470 and 495, reprinted in MONTHLY WEATHER REVIEW, Nov., 1919, pp. 803-804), is looked upon with some doubt, in view of the well-understood conditions in many such caves in various parts of the world. There is one proposition that indicates possible formation of ice in the summer time, namely, when air is so dry that the dewpoint is below the freezing point. This, however, is unlikely. In most cases heavy ice is formed late in winter and does not melt until far into the summer time. The following references supply much information on this subject:

- Glacières, or freezing caverns. E. S. Balch, Philadelphia, 1900. 326 pp. Includes bibliography.
- The Sweden-Väddö ice mine and its explanation. M. O. Andrews. *Popular Science Monthly*, vol. 82, 1913, pp. 280-288.
- Ice caves. A. M. Miller. *Science*, N. S. 37, 1913, pp. 980-981.
- Iowa Geological Survey, Annual Report, vol. XVI, 1905, pp. 142-146. Includes references.
- Ice caves and frozen wells as meteorological phenomena. H. H. Kimball. MONTHLY WEATHER REVIEW, vol. XXIX, 1901, pp. 366-371. Gives references.
- Ice caves and freezing wells. MONTHLY WEATHER REVIEW, vol. XXIX, 1901, pp. 509-510.
- The Decorah ice cave and its explanation. A. F. Kovarik. *Scientific American Supplement*, vol. 46, 1898, pp. 19158-19159.
- Ice caves of France and Switzerland. Rev. G. F. Browne, London, 1865. 315 pp.
- Geology and mineral deposits of the Colville Indian Reservation, Washington. J. T. Pardee. *U. S. Geological Survey Bulletin* 677, 1918. pp. 170-171.

— W. J. Humphreys.

### ROUND THE WORLD ON A VOYAGE OF 1,000 MILES.

After a voyage of 76 days from Melbourne, the barque *Inverneill* arrived at Bunbury, western Australia, on July 6 for Bunbury to load jarrah for South Africa, and soon after clearing Port Phillip Heads she struck a strong westerly gale, which continued for days. The vessel was driven out of her course, and through the straits. When on the other side of Wilsons Promontory the wind veered west, and the vessel was driven up the New South Wales coast. When the *Inverneill* was to the south of Sydney Heads the weather moderated, and so the captain decided to go on to Sydney.

After a short stay in Sydney he left again, and found the westerly winds still at their height. He then decided that instead of crossing the Bight he would go with the westerly wind around the world. Five days after setting sail he found himself at the north end of New Zealand, having gone a distance of approximately 1,200 nautical miles. This he considered a remarkably good record. As an average the barque traveled 240 miles a day. In 28 more days he was rounding the Horn with the wind still in a helpful direction. His trip continued for a further 33 days, when he found himself at St. Paul Island in the mid-Indian Ocean. From thence on to Bunbury the trip took 16 days. The trip was a fast one, owing to the steady westerly winds. Capt. Shippen himself estimated that the voyage would take approximately 95 days, whereas the trip from Sydney to Bunbury occupied but 76 days. Altogether Capt. Shippen estimates that he traveled 14,500 miles in his endeavor to go from Melbourne to Bunbury, and his average sailing time was 292 miles a day. He considers that such a passage has never been made before by a mariner, and expresses the opinion that he is doubtful if it will ever be repeated.—*Liverpool Journal of Commerce*.

### THE WAVE-RAISING POWER OF NORTHWEST AND SOUTH WINDS COMPARED.

Mr. C. Kennedy, meteorological observer for the Weather Bureau on the British S. S. *Indian*, Capt. I. Chadwick, in a recent communication, asks the following interesting question:

Why it is, that when we experience a wind from a northerly direction, especially northwesterly, the sea rises very quickly? On the contrary, if we experience a southerly wind, and if of a strong force, there is very little sea. This is in northern latitudes.

The following explanation of the point raised by Mr. Kennedy has been offered by Prof. W. J. Humphreys and Dr. C. F. Brooks of the Weather Bureau:

(1) Northwest winds usually are stronger than southerly winds over the America-to-England trade routes of the Atlantic and for this reason alone should give larger waves, since the wave effect increases so fast much faster than the strength of the wind.

(2) Over much of this route the winds of winter (season of rough water) are prevailingly northwest. Hence, there usually are some waves of the northwest-wind type, due either to actual winds at the time and place, or to persistence of waves from more or less previous and distant storms. Any freshening of the northwest wind would then only increase the existing wave system. The crests of the existing waves would lie at right angles, roughly, to the new wind, and their sides would be exposed to its maximum pressure. On the other hand a wind from the south would, at first, meet with less surface obstruction (because blowing rather along the waves than against their sides) and thus be less efficient in raising a sea.

(3) A given wind has a greater wave-producing effect on an already rough sea than on a smooth one. Hence, as the ocean generally is rougher in winter than in summer, owing largely to the greater frequency and severity of storms during the cold season than during the warm one, it follows that a given winter wind (usually northwest) is likely to produce a higher sea than is an equal summer wind (usually

southerly). This prevailing greater roughness of the sea during winter than during summer gives the winds of the former season, the north-westerly winds, an advantage over those of the latter season, the southerly winds.

(4) The northwest winds usually have a downward component while the southern winds commonly have an upward component. The former are also more gusty than the latter, and for both reasons more disturbing to the water—more effective in starting waves.

(5) The winter northwest wind is denser, chiefly because colder, than is the southerly wind of any season, and thus through its greater momentum more likely to produce waves.

(6) Along most of the trade routes over the North Atlantic the course of the water, Gulf Stream and Drift, is from the south. Consequently the actual velocity of a given southerly wind with reference to the water, and hence its wave-producing effect, is less than that of an equal northerly wind.

There may be still other factors in favor of the northerly and north-westerly winds over the southerly winds as producers of waves, but the above are sufficient to confirm one's confidence in the observations to that effect.—F. G. T.

### THE VARIABILITY OF CORRESPONDING SEASONS IN DIFFERENT YEARS.

By SIR FREDERICK STUPART, Director, Meteorological Office, Toronto.

[Abstracted from *Jour. Roy. Astron. Soc. of Canada* (Toronto), July–August, 1919, Vol. XIII, pp. 259–263; reprinted in the *Scientific American Supplement*, New York, Sept. 13, 1919, p. 163.]

A problem in meteorology which still remains unsolved is why corresponding seasons in different years differ so much in character. The author notes the following conditions which lead to the distinctive features of a climatic zone: (1) Distance from the Equator; (2) geographic position in relation to land and sea; (3) altitude; (4) the prevailing winds, the outcome of a general atmospheric circulation. Inasmuch as the first three factors are practically constants in any given case, the natural assumption is that the prime cause of seasonal climatic variation must be due to variation in atmospheric circulation. The writer then contrasts the remarkably cold winter of 1917–18 with the very mild winter of 1918–19, adding the pertinent question: "Why the difference?" He then proceeds to discuss what may be termed the *normal* distribution of atmospheric pressure and shows how the pressure of the two winters noted differ from the normal.

Referring to Canada and region to the northward, he says:

In the early part of the winter of 1917–18 the anticyclonic type was more pronounced than in any other winter on record, and with most persistent areas of high barometer coming in over Yukon, perhaps indeed offshoots from the great Siberian winter anticyclone, the Northern Pacific low pressure was situated much farther south than usual and its offshoots, in the form of traveling low areas, passed into Canada over southern British Columbia and thence kept away to the southward, and the result was a prevalence of northerly winds, not only in the western Provinces but also in eastern Canada.

During the winter just closed [1919] we find conditions in strong contrast to those of the previous year; the Northern Pacific low was extremely energetic and in a stream of offshoot cyclonic areas, which impinged on the northern Alaskan coast, prevented the formation of anticyclonic conditions, and, passing first southeastward, finally moved eastward as dispersing areas across the western Provinces, there giving most persistent gradients for southerly and southwesterly winds with unseasonably high temperature.

In closing, the author believes the time is now ripe for increased investigation regarding the changes, both in the position and the temperatures of the great ocean currents. "If it can be shown," he says, "that the great Japan Current in some years carries its warm waters farther north than in other years, it may not improbably be subsequently shown that in such years cyclonic conditions are more intense near the Alaskan coast, and we shall at once have valuable information regarding the

probable distribution of barometric pressure in north-western America, and this appears to be a dominating factor in the character of our winter seasons.

"While it would appear probable that conditions that would increase the temperature and the flow of ocean currents would act simultaneously in both hemispheres, it does not necessarily follow that the effect on the northern coast of Europe would occur simultaneously with the effect on the northwest coast of America. One would surmise that as the source of the Gulf Stream is nearer the British Isles than is the source of the Japan Current to Alaska, therefore Europe would be affected before America and quite possibly this is the case. The whole question is complex but well worthy of study."—H. Lyman.

### WINTERS AT NEW YORK CITY.

By J. MALCOLM BIRD.

[Notes on article "What about the old-fashioned winter?" *Scientific American*, Mar. 6, 1920, pp. 253, 261, 262, 3 figs.]

Graphs of winter snowfall, of winter average temperature, and of dates of opening and closing of navigation on rivers, for a long period, are always interesting to study, especially, since the results of such investigation recalls past snowy or cold winters and show that unusual winters are not of infrequent occurrence. The extraordinarily cold winter of 1917–18 does not stand as a marked anomaly on the temperature graph for New York City for the last 50 years, nor (except on the snowfall graph) does the mild winter of 1918–19 look so striking as it seemed. The past winter as shown by the graphs for New York City was an ordinary one.

The graph showing the duration of closed navigation on the Hudson between New York and Albany for the last 75 years is of considerable interest. The average duration of closed navigation is 101 days, from December 14 to March 25. The extremes were 140 days in 1896–97, and 0 days 1912–13, November 22 (1873), and April 29 (1897).

### DISCUSSION.

The winter of 1896–97 having the longest duration of closed navigation was only a fraction of a degree below normal in temperature and had only 4 inches more than the average snowfall. This should be a caution to those who seek from ice-in-rivers statistics to draw conclusions as to the characters of winters.

The graph of winter snowfall shows a general decrease in the depth of snowfall during the last 30 years. The maximum of 76 inches in 1892–93 has been followed by snowy winters having 53 (1898–99), 57 (1904–5), 52 (1906–7), 47 (1915–16), 49 (1916–17), and 46 (1919–20). The successive minima (below 25 inches) have been 25 (1885–86), 22 (1888–89), 20 (1897–98), 20 (1899–1900), 10 (1900–1901), 23 (1905–6), 21 (1908–9), 16 (1912–13), and 4 (1918–19). Perhaps the growth of the city and the consequent increase of its effective heating of the air under the low clouds when snow is falling is responsible for this apparent decrease in snowiness. The temperature records do not give any indication of a tendency to warmer winters. In the coldest weather, when much snow is not likely to fall, the sky is usually clear and the wind strong enough to allow heating of the air by the city to have no appreciable effect on the temperature. On warm days the artificial heating of buildings is negli-